

b1 (iii_{A1}) the ethylene (co)polymer has a ratio of Mw/Mn (Mw denotes the weight average molecular weight; Mn denotes the number average molecular weight) measured by gel permeation chromatography is not lower than 1.8 and lower than 4.5.

3. (Amended) The ethylene (co)polymer (A1) according to claim 1 or 2, wherein

b2 (iv_{A1}) the intrinsic viscosity $[\eta]$ in dl/g and the density d in g/cm³ satisfy the following relation:

$d \geq 0.0003 \times [\eta]^2 - 0.0121 \times [\eta] + 0.9874$; in the case the intrinsic viscosity measured at 135°C in decalin is 0.3 to 1.5 dl/g.

4. (Amended) The ethylene (co)polymer (A1) according to claim 1 or 2, wherein

(v_{A1}) the intrinsic viscosity $[\eta]$ in dl/g measured at 135°C in decalin and the melt flow rate MFR in g/10 minutes measured under 2.16 kg load at 190°C satisfy the following relations:

$[\eta] > 1.85 \times \text{MFR}^{-0.192}$ when $\text{MFR} < 1$, and

$[\eta] > 1.85 \times \text{MFR}^{-0.213}$ when $\text{MFR} \geq 1$.

5. (Amended) The ethylene (co)polymer (A1) according to claim 1 or 2, wherein

(vi_{A1}) when the comonomer content is 1.5 mole% or higher, an amount of components eluted at 105°C or higher in a heating elution

separation test is not more than 5% by weight; and when the comonomer content is less than 1.5 mole%, an amount of components eluted at 106°C or higher in a heating elution separation test are not more than 8% by weight.

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6. (Amended) The ethylene (co)polymer (A1) according to claim 1 or 2, wherein

(vii_{A1}) the components are precipitated at 15% by weight or lower when said ethylene (co)polymer is dissolved in p-xylene at 130°C, then cooled to 75°C, and finally the dissolved components are precipitated in a poor solvent.

7. (Amended) The ethylene (co)polymer (A1) according to claim 1 or 2, wherein

(viii_{A1}) the % by weight W of the decane-soluble components at 23°C and the density d in g/cm³ satisfy the following relations:

$W < 80 \times \exp(-100 \times (d - 0.88)) + 0.1$ when MFR ≤ 10 g/10 minutes; and

$W < 80 \times (\text{MFR} - 9)^{0.26} \times \exp(-100 \times (d - 0.88)) + 0.1$ when MFR > 10 g/10 minutes.

8. (Amended) The ethylene (co)polymer (A1) according to claim 1 or 2, wherein

(ix_{A1}) the α -olefin content K in mole% and the melting point T_m in °C of the highest peak of an endothermic curve measured by a differential scanning calorimeter satisfy the following relations:

T_m ≤ 135.0 - 10.0K in the case K = 0.1 to 1.5 mole%;

T_m ≤ 121.9 - 1.3K in the case K = 1.5 to 5.5 mole%; and

T_m ≤ 139.7 - 4.5K in the case K = 5.5 to 20 mole%.

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9. (Amended) The ethylene (co)polymer (A1) according to claim 1 or 2, wherein

(x_{A1}) the number of branches having a length equivalent to that of hexyl or longer measured by ¹³C-NMR is less than 0.1 per 1,000 of carbon atoms.

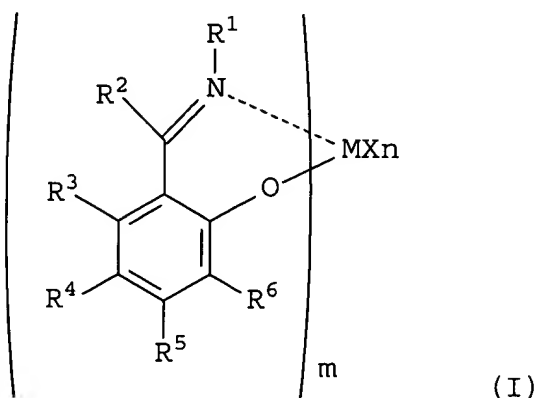
10. (Amended) The ethylene (co)polymer (A1) according to claim 1 or 2, wherein the ethylene (co)polymer is a copolymer of ethylene and 1-butene.

11. (Amended) The ethylene (co)polymer (A1) according to claim 1 or 2, wherein the ethylene (co)polymer is a copolymer of ethylene and 1-hexene.

12. (Amended) The ethylene (co)polymer (A1) according to claim 1 or 2, said ethylene (co)polymer (A1) is produced by either homopolymerization of ethylene or copolymerization of ethylene and α -

olefin of 4 to 20 carbon atoms in the presence of an olefin polymerization catalyst comprising:

(a1) a transition metal compound of the following general formula (I)



wherein M denotes a transition metal atom selected from the group IV and the group V of the periodic table;

m denotes 1 or 2;

R¹ denotes an aliphatic hydrocarbon group of 5 or more carbon atoms in total which may have alicyclic hydrocarbon group substituents or alicyclic hydrocarbon group of 7 or more carbon atoms in total which may be aromatic hydrocarbon group or aliphatic hydrocarbon group substituents;

R² to R⁵ may be the same or different to one another and each denotes a hydrogen atom, a hydrocarbon group, a hydrocarbon group-substituted silyl, an oxygen-containing group, a nitrogen-containing group, or a sulfur-containing group and two or more of R² to R⁵ may be bonded to one another to form a ring;

R^6 denotes a hydrocarbon group or a hydrocarbon-substituted silyl group;

in the case m is 2, at least one of the groups denoted as R^2 to R^6 belonging to any one of the ligands may be bonded to at least one of the groups denoted as R^2 to R^6 belonging to another ligand;

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in the case m is 2, two of R^1 , two of R^2 , two of R^3 , two of R^4 , two of R^5 , and two of R^6 may be the same or different to one another, and at least one of the groups R^2 to R^6 on ligand may be bonded to at least one of the groups R^2 to R^6 on another ligand;

n denotes a number satisfying the valence of M ;

X denotes a hydrogen atom, a halogen atom, a hydrocarbon group, an oxygen-containing group, a sulfur-containing group, a nitrogen-containing group, a boron-containing group, an aluminum-containing group, a phosphorus-containing group, a halogen-containing group, a heterocyclic compound residue group, a silicon-containing group, a germanium-containing group, or a tin-containing group; in the case n is 2 or higher, each X may be the same or different to one another and each X may be bonded to one another to form a ring; and optionally

(b) at least one compound selected from the group consisting of:

(b-1) an organometallic compound,

(b-2) an organoaluminum oxy compound, and

(b-3) a compound capable of forming ion pairs by reaction on the transition metal compound.

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With the above amendments, claims 1 and 3-12 have been amended. Claims 1-77 are pending with claims 13-77 having been withdrawn from a prior restriction requirement. Thus, claims 1-12 are ready for further action on the merits. No new matter has been added by way of the above amendments. The amendments have been made to correct multiple dependencies and simply for clarity's sake. Reconsideration is respectfully requested in light of the following remarks.

Claim Objections

The Examiner has objected to claims 4-12 under 37 CFR §1.75(c) as being in improper form for multiple dependency. Applicants have amended these claims so that they are not longer multiply dependent. Withdrawal of the objection is respectfully requested.

The Examiner has objected to claim 5, lines 16 to 22 asserting that it cannot be understood. Applicants have amended claim 5 so that it is more understandable. Moreover, the Examiner has objected to the misspelling of the word "eluded" asserting that it should be "eluted". Applicants have corrected this error. Withdrawal of the objections is respectfully requested.

The Examiner objects to claim 6 asserting that lines 3 to 6 are not understood. Applicants have amended claim 6 so that those of skill in the art can understand it. Withdrawal of the objection is respectfully requested.

The Examiner objects to claim 8 for reciting overlapping dependent variables. In particular, the Examiner asserts that when K is 5.5 moles, $T_m \leq 114.75$ (second equation) or $T_m \leq 114.95$ (third equation). Applicants respectfully point out that 5.5 has two significant figures and is asserting that there is overlap at the fourth significant figure (for the numbers 114.75 and 114.95). Moreover, Applicants respectfully point out that there is essentially no difference between these two numbers, or in other words, they are substantially the same. Withdrawal of the objection is warranted and respectfully requested.

The Examiner objects to claim 12 at page 360, line 5 for reciting "them" asserting that it is unknown to what "them" refers. Applicants point out that it refers to " R^2 to R^5 " and have amended claim 12 to recite " R^2 to R^5 ". Moreover, the Examiner also asserts that lines 13-16 on page 360 are not understood. This part of claim 12 has been amended to more clearly recite what is meant. Withdrawal of the objections is respectfully requested.

The Examiner also objects to claim 12 because the Examiner asserts that it is unclear how all the "X"s recited in claim 12 can form rings. Applicants respectfully point out that one of skill in the art would immediately know what members of "X" can form rings and which ones cannot. Accordingly, Applicants respectfully request withdrawal of the objection.

Regarding component (b), the Examiner asserts component (b) is essential. Applicants disagree. Applicants point out that component (b) is optional and is not an essential component. Accordingly, Applicants have amended claim 12 to recite "optionally" instead of "if necessary". Withdrawal of the objection is warranted and respectfully requested.

Rejections under 35 USC §§102/103

Claims 1, 10, and 11 have been rejected under 35 USC §102(b) as allegedly being anticipated by Akagawa '764 (US Patent No. 5,837,764).

Claims 1 and 10 have been rejected under 35 USC §102(e) as allegedly being anticipated by Sacchetti '841 (US Patent No. 6,096,841).

Claims 1-12 have been rejected under 35 USC §102(e) as allegedly being anticipated by, or in the alternative, as allegedly being obvious over Fujita '997 (US Patent No. 6,309,997).

Claims 1-12 have been rejected under 35 USC §102(a) as allegedly being anticipated by, or in the alternative, as allegedly being obvious over EP '005 (EP 0 874 005).

These rejections are traversed for the following reasons.

Removal of the Rejections over Akagawa '764 and Sacchetti '841

Applicants respectfully point out that Akagawa '764 and Sacchetti '841 do not disclose or suggest an ethylene (co)polymer that contains

methyl branches less than 0.1 in number per 1,000 carbon atoms measured by ^{13}C -NMR. The Examiner's assertion that Akagawa '764 and Sacchetti '841 anticipate the instant invention is based upon the assumption that insertion of comonomers always occurs in a 1,2 fashion thus generating a copolymer with no methyl branching. Applicants acknowledge that if insertion of comonomers always proceeds in a 1,2-fashion, then methyl branching is minimized. However, this is not the case in either Akagawa '764 or Sacchetti '841. The orientation of comonomers is dependent upon the catalyst used as well as other factors. This is confirmed in the comparative examples in the written description. Ethylenhomopolymer may have methyl branchings. Accordingly, the rejection is inapposite. Withdrawal of the rejection is warranted and respectfully requested.

Removal of the Rejections over EP '005 and Fujita '997

The Examiner in the Office Action states

As to the physical properties, a reasonable basis exists to believe that the materials described in Fujita et al. exhibit the recited properties because the polymer produced therein is prepared in essentially the same manner as that described in the present claims.

Applicants disagree.

The inventive ethylene (co)polymer of the instant invention was first obtained by using the specific transition metal compound as demonstrated in the working embodiments of the present written description. Neither Fujita '997 nor EP '005 disclose this specific

compound.

Moreover, the compounds disclosed in Fujita '997 and EP '005 are completely different from those claimed in amended claim 12. In particular, claim 12 has been amended so that "R¹ denotes an aliphatic hydrocarbon group of 5 or more carbon atoms in total which may have alicyclic hydrocarbon group substituents or alicyclic hydrocarbon group of 7 or more carbon atoms in total which may be aromatic hydrocarbon group or aliphatic hydrocarbon group substituents". The compounds disclosed in Fujita '997 and EP '005 do not fall within the scope of this element.

Almost all of the compounds listed in Fujita '997 and EP '005 have aromatic groups (phenyl, etc.) as R¹. The closest compounds disclosed in Fujita '997 are compounds A-39 and B-39 at column 208. However, because both of these compounds disclose benzyl groups as R¹, neither of these compounds fall within the scope of instant claim 12.

Moreover, compounds A-39 and B-39 of Fujita '997 are not effective at producing the ethylene (co)polymer of the instant invention. As proof, Applicants attach a 37 CFR §1.132 declaration signed by Dr. Mitani, one of the inventors of the instant invention.

Dr. Mitani conducted experiments comprising the copolymerization of ethylene and butene-1 using the olefin polymerization catalyst comprising the compound A-39 or B-39. As can be seen in Experiment 1 of the declaration, ethylene/butene-1 copolymer obtained by using the compound (B-39) does not satisfy the claimed requisite (ii_{A1}). Further,

Experiment 2 shows that the compound (A-39) is not effective in the compolymerization of ethylene and butene-1.

Thus, neither Fujita '997 nor EP '005 can anticipate or render obvious the instant invention because they fail to disclose the elements of the instantly claimed invention. Accordingly a *prima facie* case of obviousness has not been made. Even if a *prima facie* case had been made, which Applicants do not concede, the instant invention displays unexpectedly superior properties over Fujita '997 and EP '005. For the above reasons, Applicants submit that the rejection is inapposite. Withdrawal of the rejection is warranted and respectfully requested.

With the above remarks and amendments, it is believed that the claims, as they now stand, define patentable subject matter such that a passage of the instant invention to allowance is warranted. A Notice to that effect is earnestly solicited.

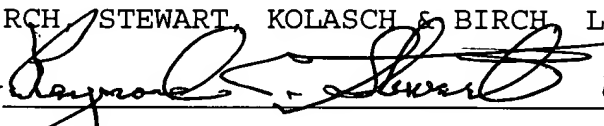
If any questions remain regarding the above matters, please contact Applicant's representative, T. Benjamin Schroeder (Reg. No. 50,990) in the Washington metropolitan area at the phone number listed below.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

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By

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Declaration under 37 CFR §1.132